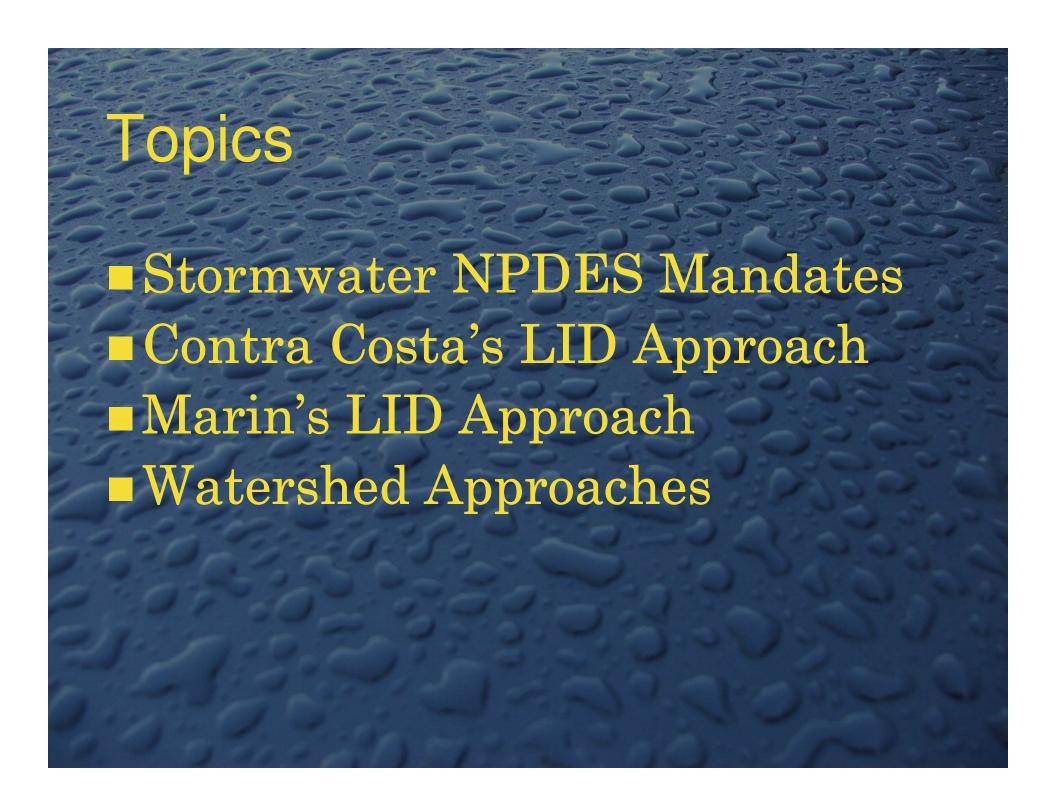
Low Impact Development for Stormwater Treatment and Hydrograph Modification Management

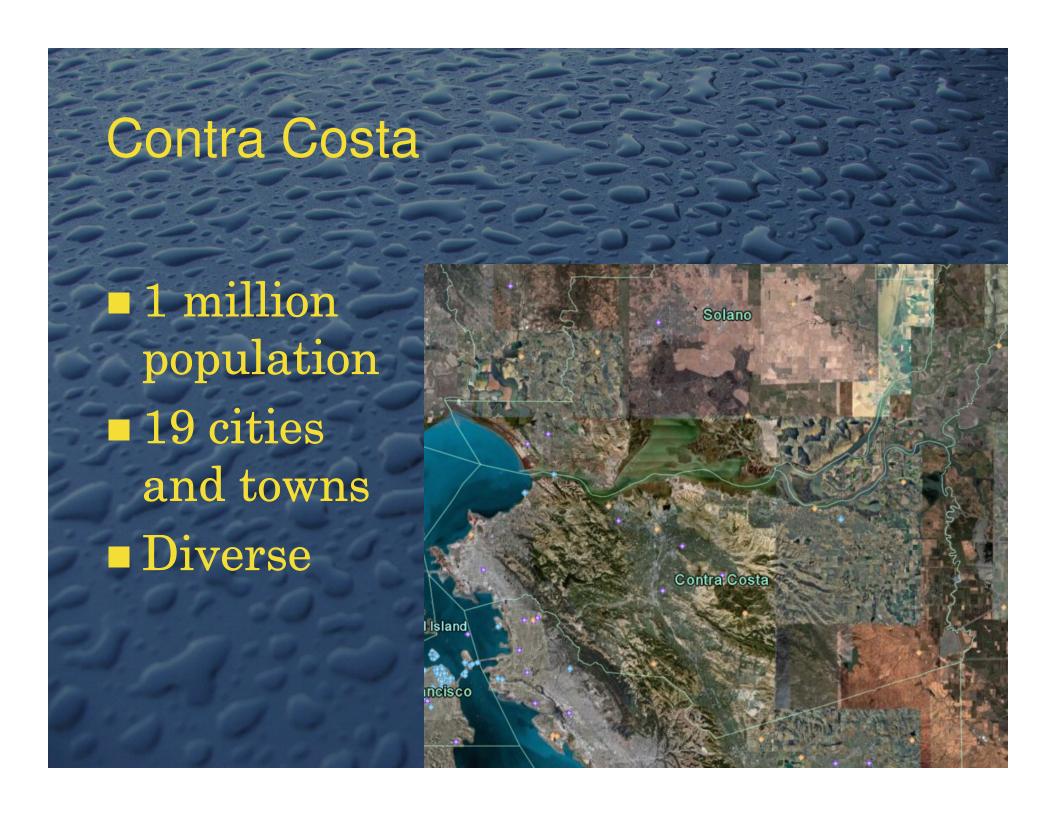
Regulatory Mandates and Watershed Approaches

Tom Dalziel, Assistant Program Manager, Contra Costa Clean Water Program

Dan Cloak, P.E., Principal, Dan Cloak Environmental Consulting







NPDES requirements for new developments

- Minimize imperviousness
- Control pollutant sources
- Treat stormwater prior to discharge from the site
- Match peaks and durations to pre-project conditions (HMP)
- Maintain treatment and flowcontrol facilities in perpetuity



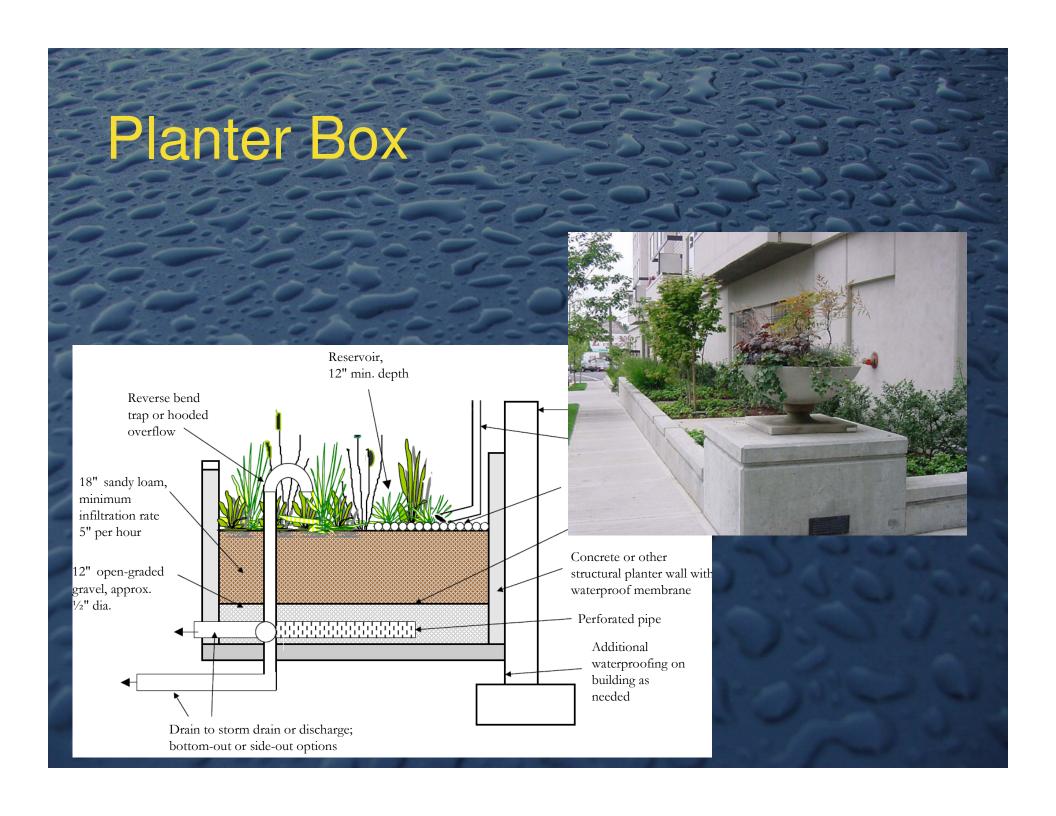
Low Impact Development

- Stormwater treatment and flow control
- Minimize imperviousness
- Disperse runoff
- Use IntegratedManagement Practices(IMPs)

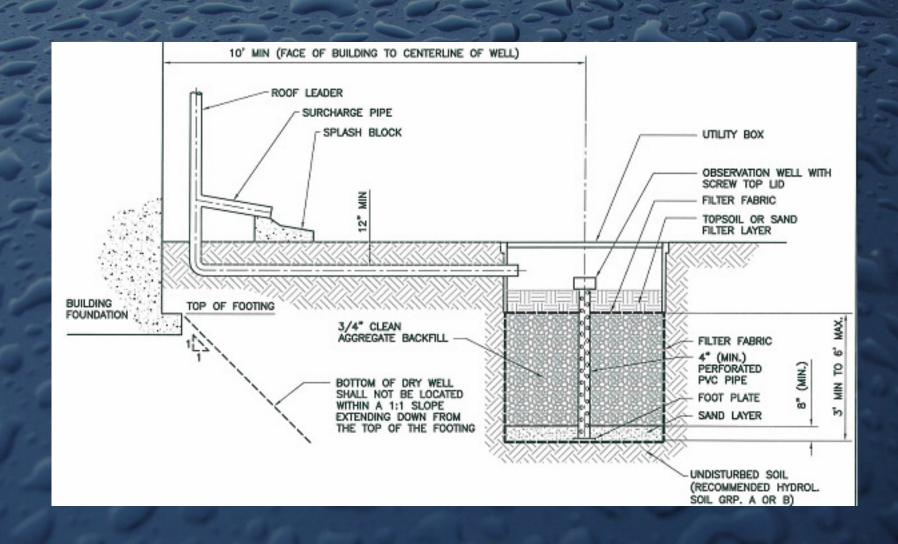




Swale grasses or landscape plantings 1% min 6" min. depth 12" curb cut 6" perforated pipe 18" x 12"; ½" gravel native soil; no or drain rock compaction 6' min. overall

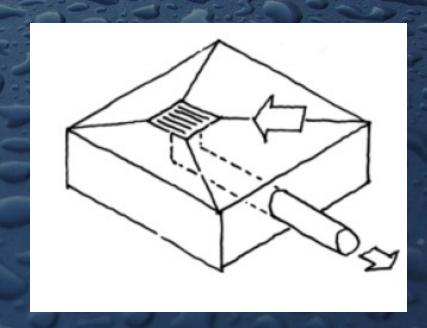


Dry Well



Showing Treatment Compliance

- NPDES Permit sizing criteria for treatment control:
 - "collect and convey" drainage design
 - conventional, "end of pipe" treatment







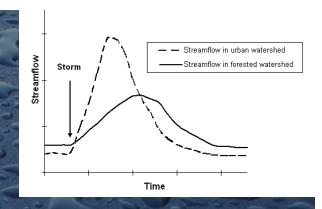
BMP Area/Impervious Area = 0.2/5 = 0.04

Planting medium i = 5 inches/hour

Application of sizing factor

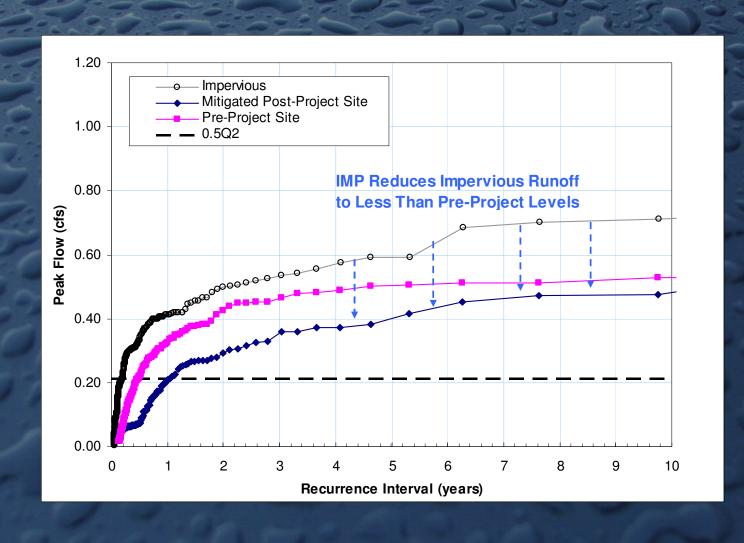


LID for flow control

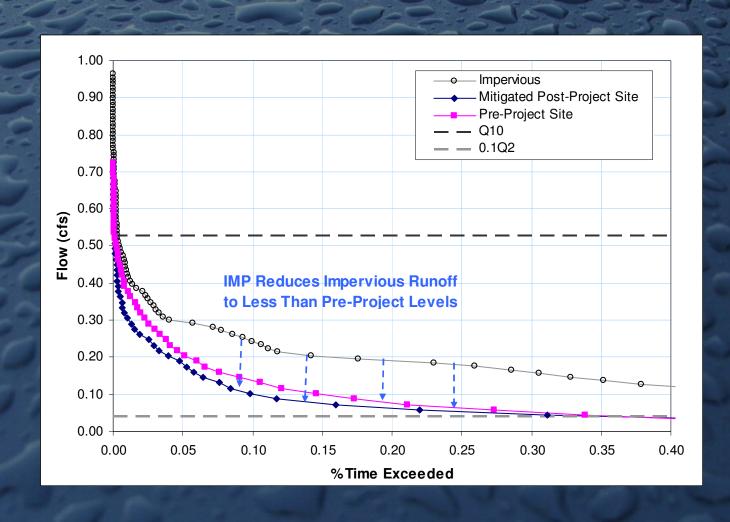


- Can LID facilities mitigate increased peaks and volumes of flows from impervious areas?
- How would we demonstrate that?
- What are the design criteria?

LID to Control of Peak Flows



LID for Flow Duration Control

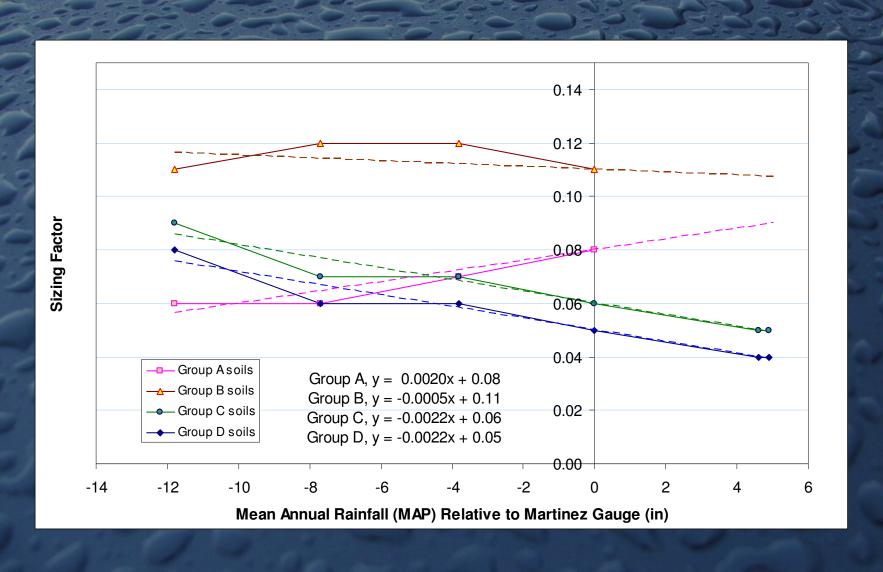


Sizing Factors for Flow Control

IMP	Sizing Factors
In-Ground Planter	Group A: 0.08 Group B: 0.11 Group C: 0.06 Group D: 0.05
Flow- Through Planter	Group C: 0.06 Group D: 0.05
Vegetated/ Grassy Swale	Group A: 0.10 to 0.14 Group B: 0.14 to 0.21 Group C: 0.10 to 0.15 Group D: 0.07 to 0.12
Bioretention Basin	Group A: 0.13 Group B: 0.15 Group C: 0.08 Group D: 0.06

VENERA	IMP	Sizing Factors
Maria Allanda	Dry Well	Group A: 0.05 to 0.06 Group B: 0.06 to 0.09
	Infiltration Trench	Group A: 0.05 to 0.06 Group B: 0.07 to 0.10
	Infiltration Basin	Group A: 0.05 to 0.10 Group B: 0.06 to 0.16

Adjustment to annual rainfall



Implementation

- Committees of municipal planners, engineers, and attorneys
- Stormwater C.3 Guidebook
- Model Ordinance
- Workshops
- Continuous Improvement

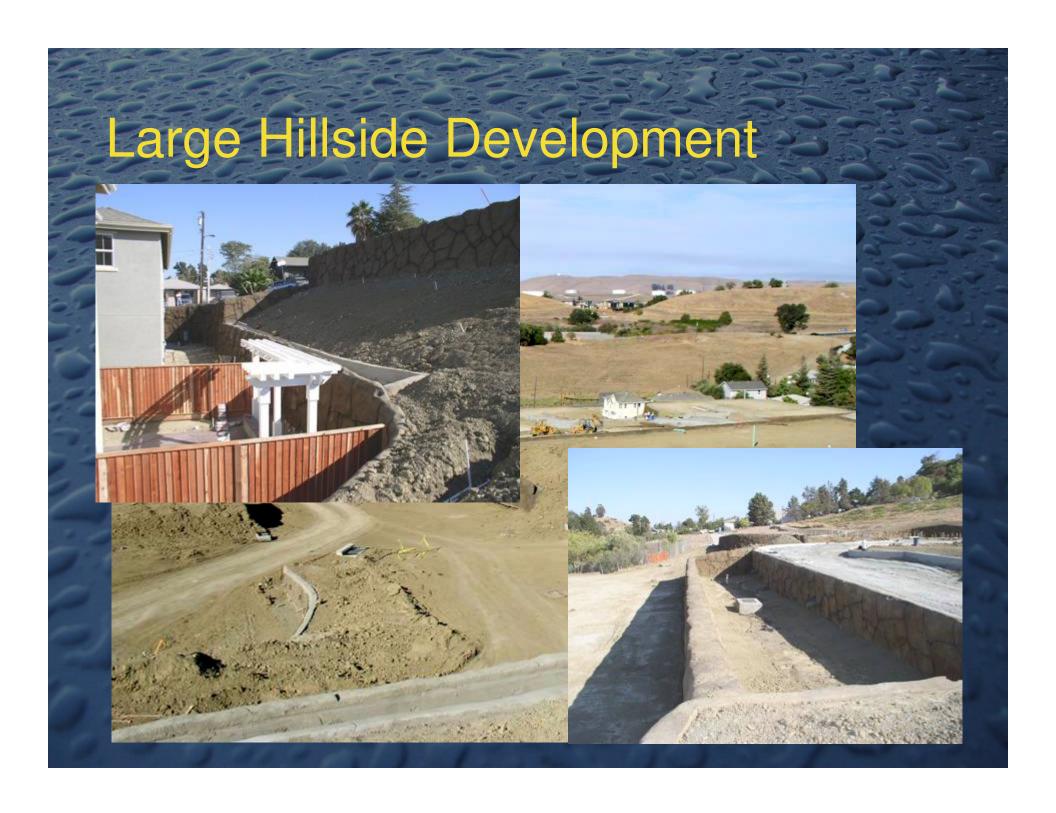
Bioretention Areas — Subdivision







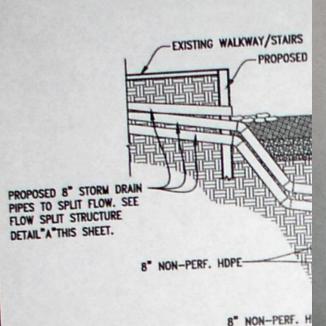




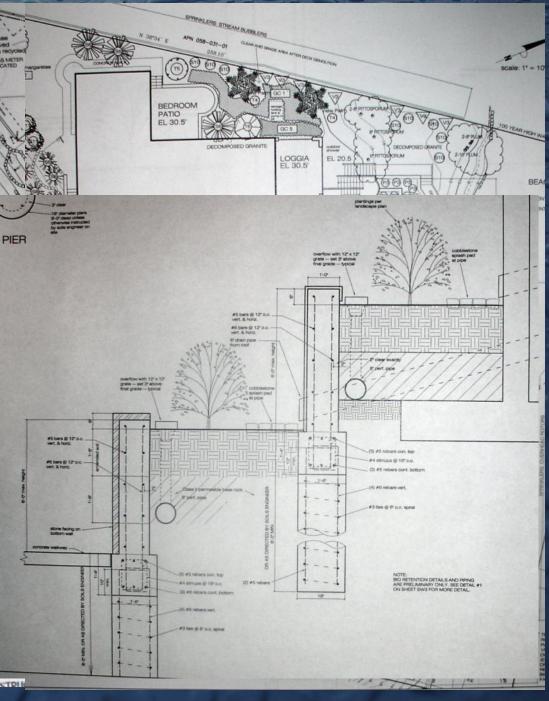
Marin County Experience

- 11 cities and towns, plus the County
- Phase II Statewide NPDES Permit
- LID Approach—simplified
- 32 pp. *Guidance for Applicants*
- Discretionary for single-family hillside residences
- Watershed context

Bayside Single Residential



NOTES:



Site Controls & Watersheds

- Strict regulatory mandates lead to widespread implementation of controls
- Hydrograph modification management promised more than it could deliver
- Permit criteria inhibit use of LID
- Application of criteria to individual sites sometimes doesn't make sense from a watershed view

Recommended Strategy

- Use results of implementation so far
- Mandate a reasonable, achievable level of LID for all sites
- Allow a narrow set of exceptions
- Regulate high-impact sites directly
- View site controls as one element of a watershed protection program

